

Role of Inland Waterways in Continental Transport System



*The Great Lakes and
St. Lawrence Seaway
Example*

**Inland Nav CoP
Workshop**

September 19, 2007

Presented by: Dr. Alexander E. Metcalf, President (TEMS, Inc.)

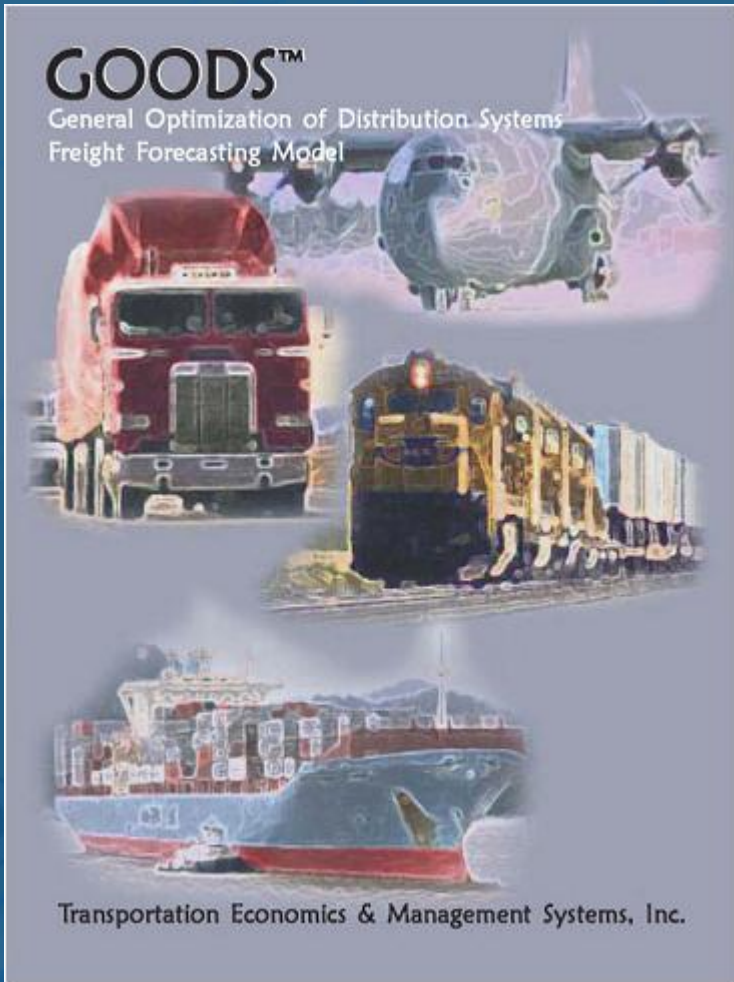
The Great Lakes and St. Lawrence Seaway Example: Purpose of Study

“To Assess New Cargoes in Relation to Both Shippers Demand Requirements and the Potential of Carriers to Meet those Requirements.”

Key Issues:

- Competitive Environment**
- Potential Cargo Markets**
- Technology Options**
- Vessel Operations**

GOODS™ General Optimization of Distribution Systems

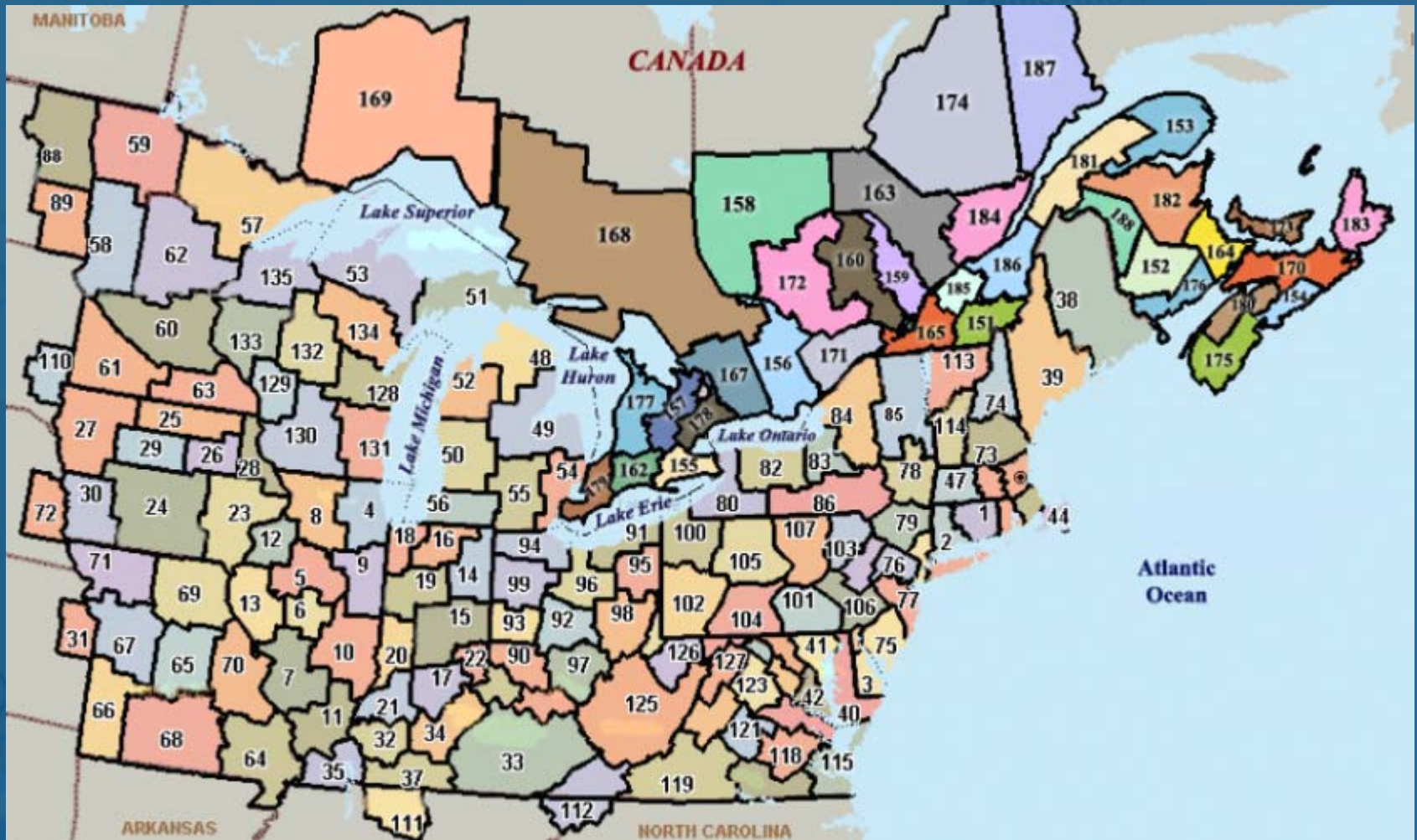


GOODS™ is a modeling framework designed to support the analysis of freight traffic flows at the regional or urban level. The **GOODS™** model uses data on current traffic flows, regional economic growth potentials, and specific industrial development proposals to develop total freight traffic flows and forecasts.

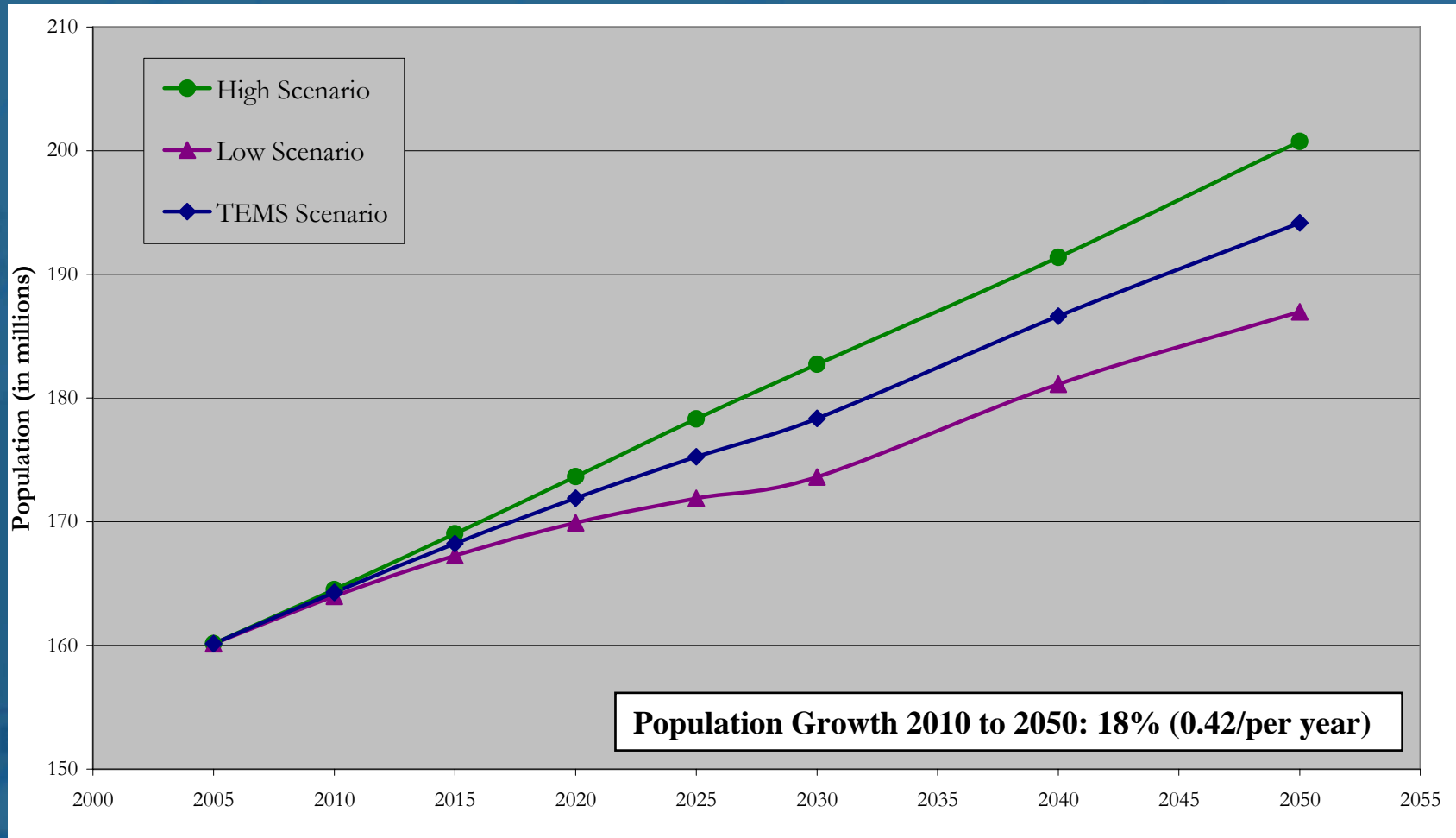
The methods used in the **GOODS™** model include specific and different analysis systems for bulk, unitized traffic (container or trailer on flat car or truck), and parcel traffic. Bulk traffic is forecast on a product-specific basis (e.g., coal, ores, grains, and oil), while non-bulk traffic is forecast using more aggregate market-related techniques. The impact of new routes, infrastructure, costs, or service implications is assessed to provide both modal and route choice traffic predictions.

The evaluation processes of the **GOODS™** model include both financial and economic analyses that identify the commercial potential of new transportation infrastructure, as well as the economic benefits to users and surrounding communities. The **GOODS™** model operates directly in conjunction with the Economic Rent Model **RENTS™** to provide output benefits (employment, income, and property values) associated with any specific freight infrastructure improvement.

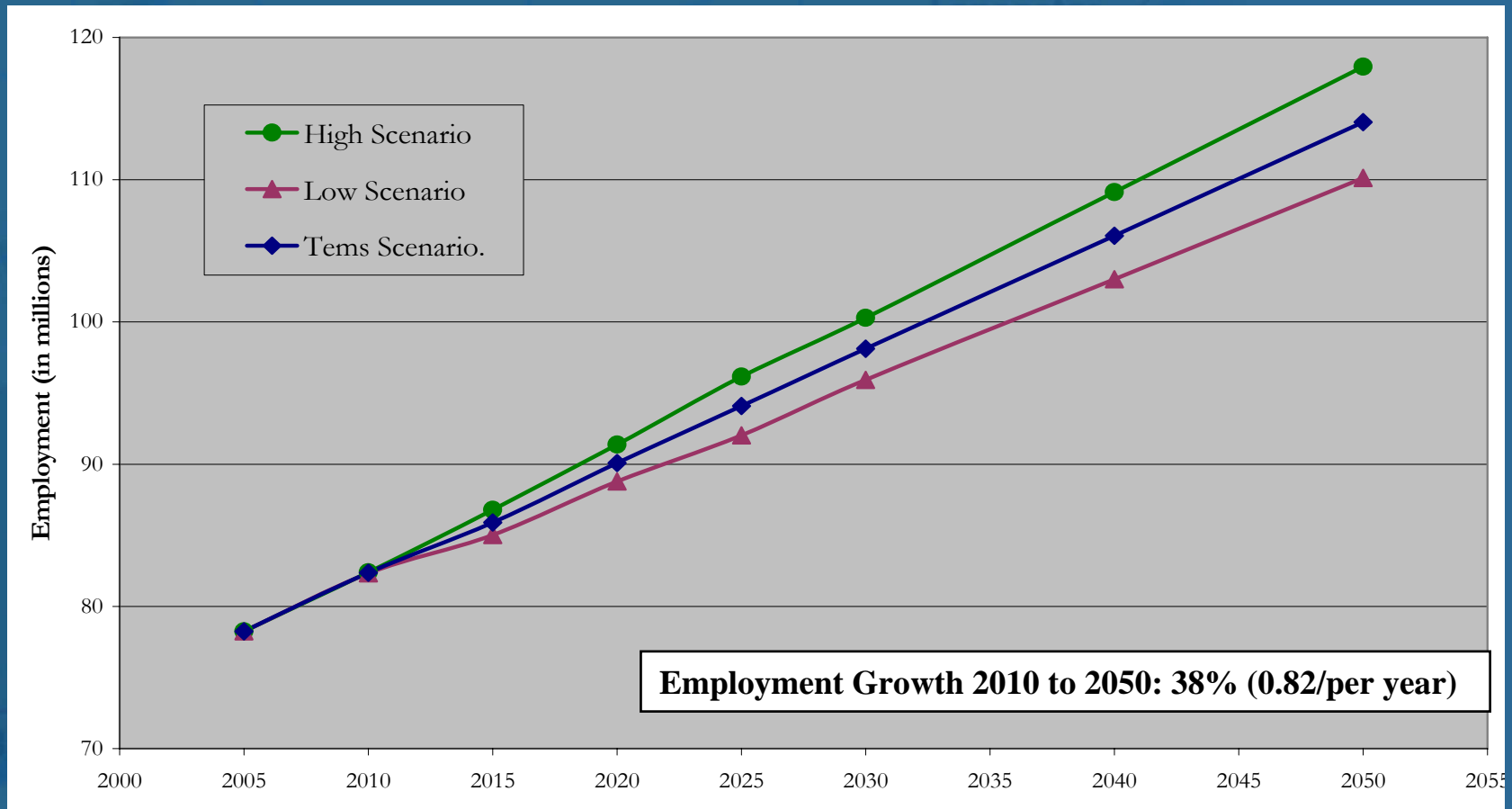
Regional Significance of Study Area (GLSLS Zone System)



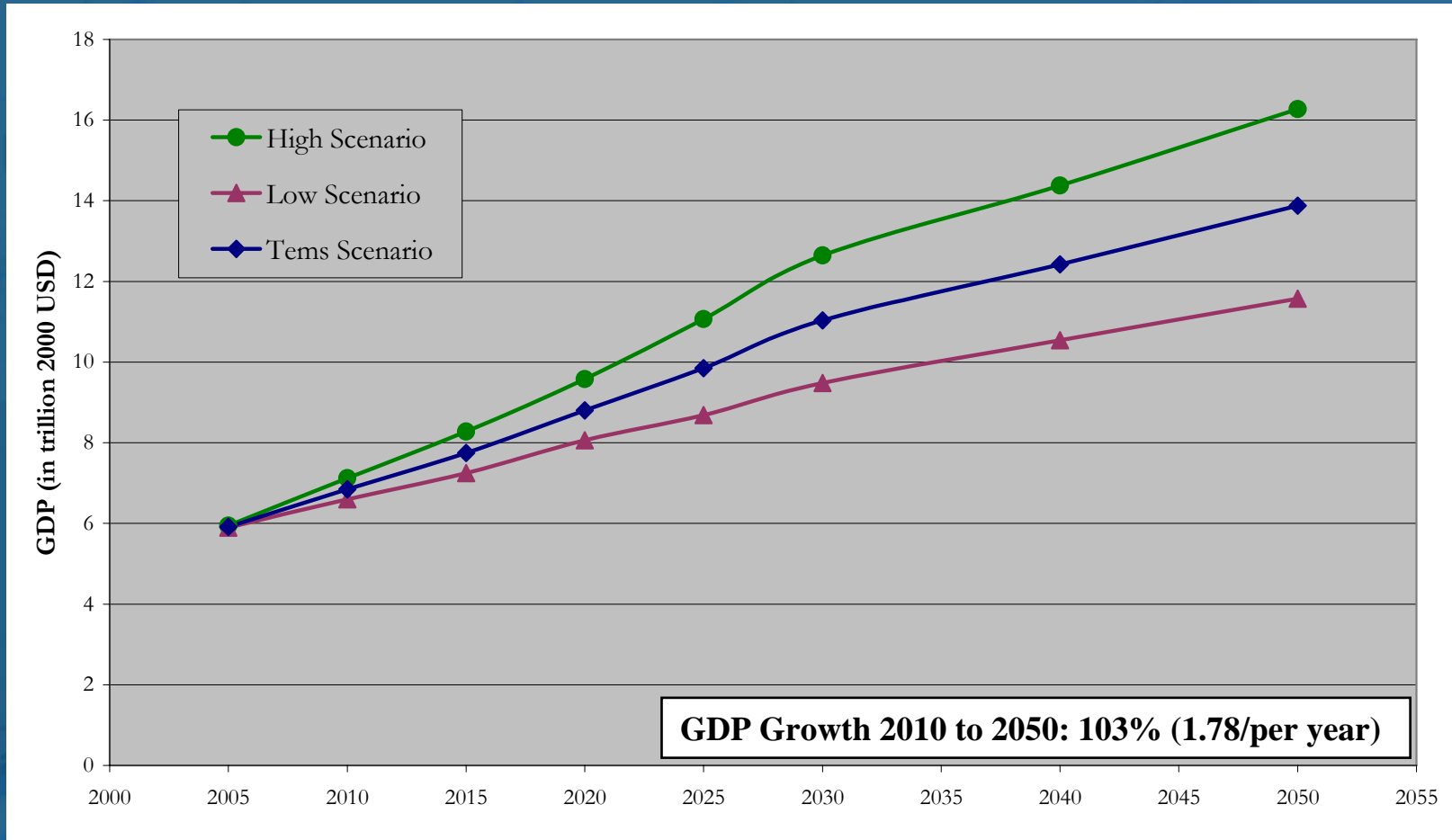
GLSLS Area Population Forecast



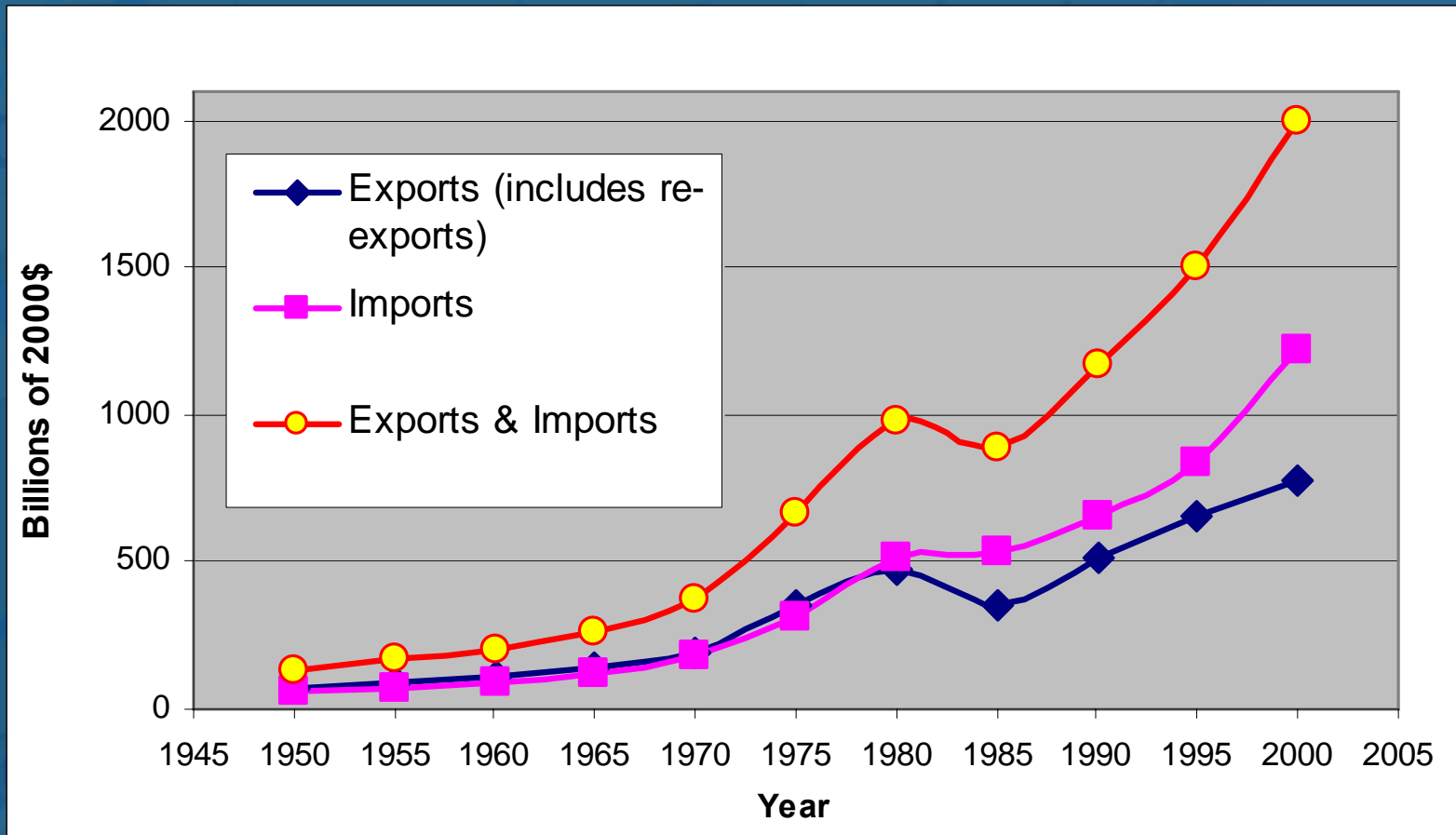
GLSLS Area Employment Forecast



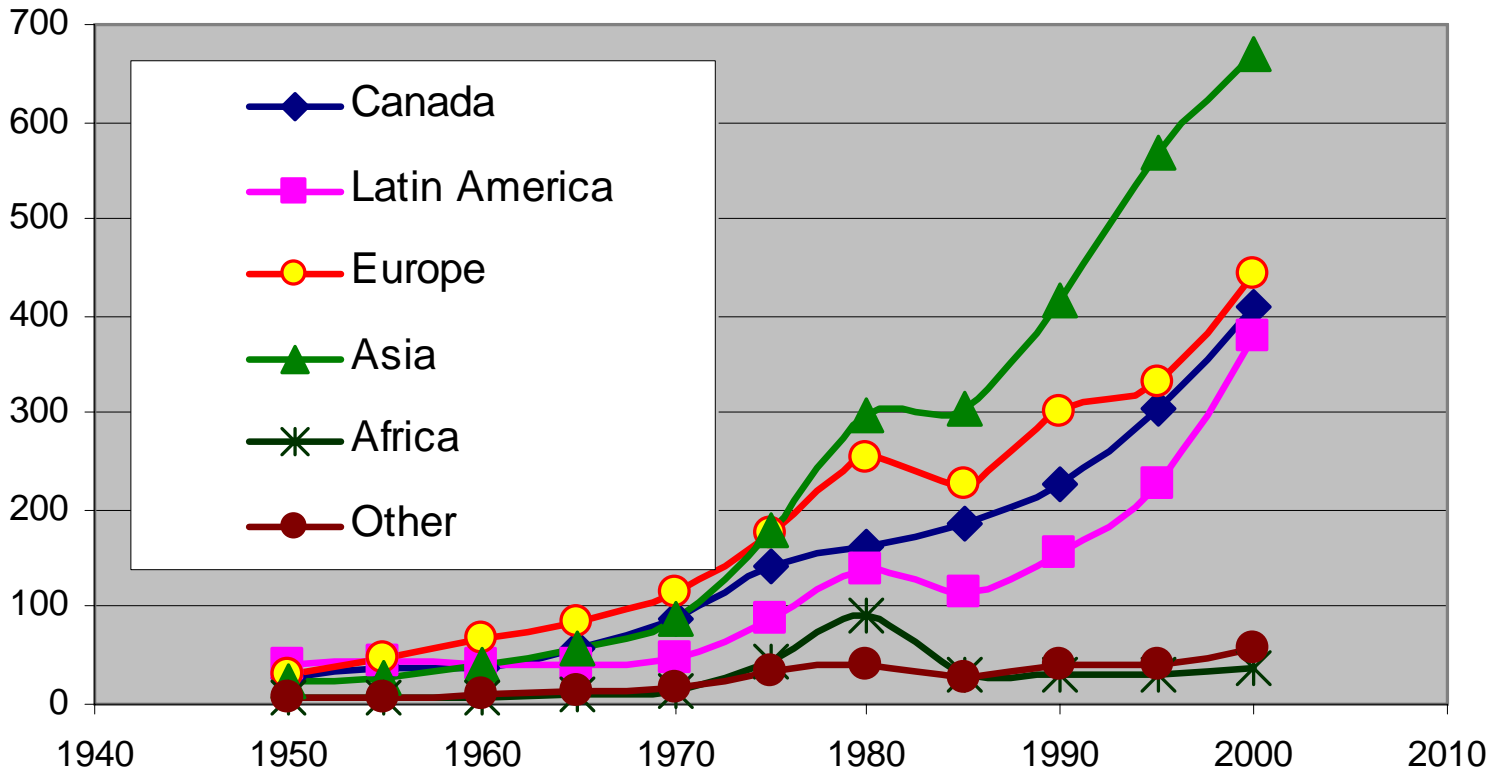
GLSLS Area Gross Domestic Product Forecast



U.S. Exports and Imports (1950-2000)



U.S. Exports & Imports by International Region (1950-2000)



Trade is an Increasing Component of Gross Domestic Product (GDP)

- 1950 less than 10% of GDP was from trade
- 2050 more than 50% of GDP will be from trade

“Globalization is radically changing the economy”

New Economy Businesses

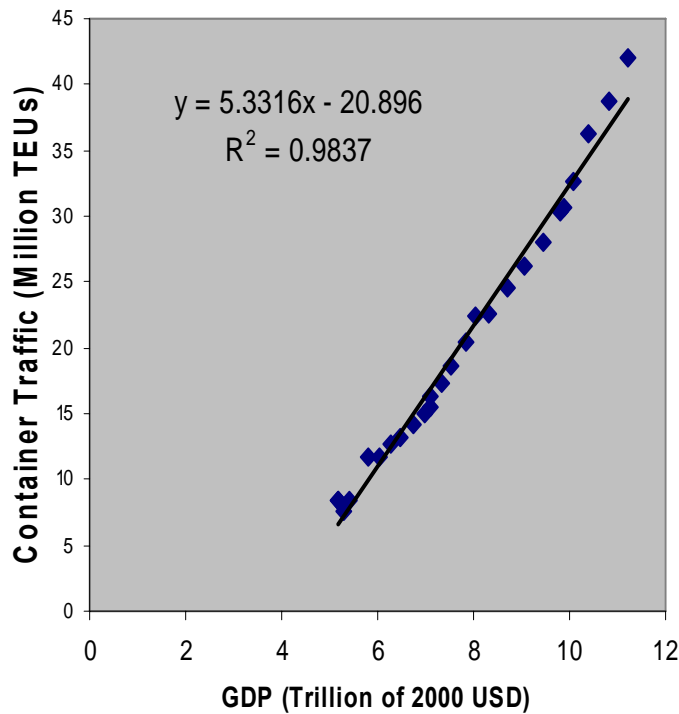
1. Computer Industry
2. Biotech Industry
3. Telecommunications Industry
4. Medical/Pharmaceutical Industry
5. Electronics/Robotic Industry
6. Chemical/Oil related products-plastics
7. Metallurgical Products
8. Industrial/Business Processes

Common Characteristics

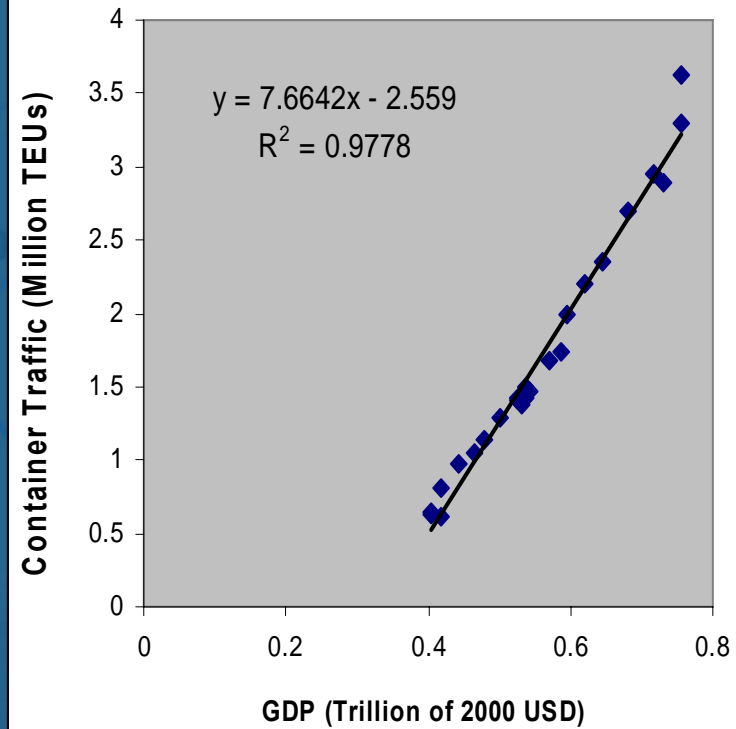
- High Value Added
- Just-In Time
- Containerized/Palletized Loads

Economic Growth and Container Traffic

United States (1980-2005)

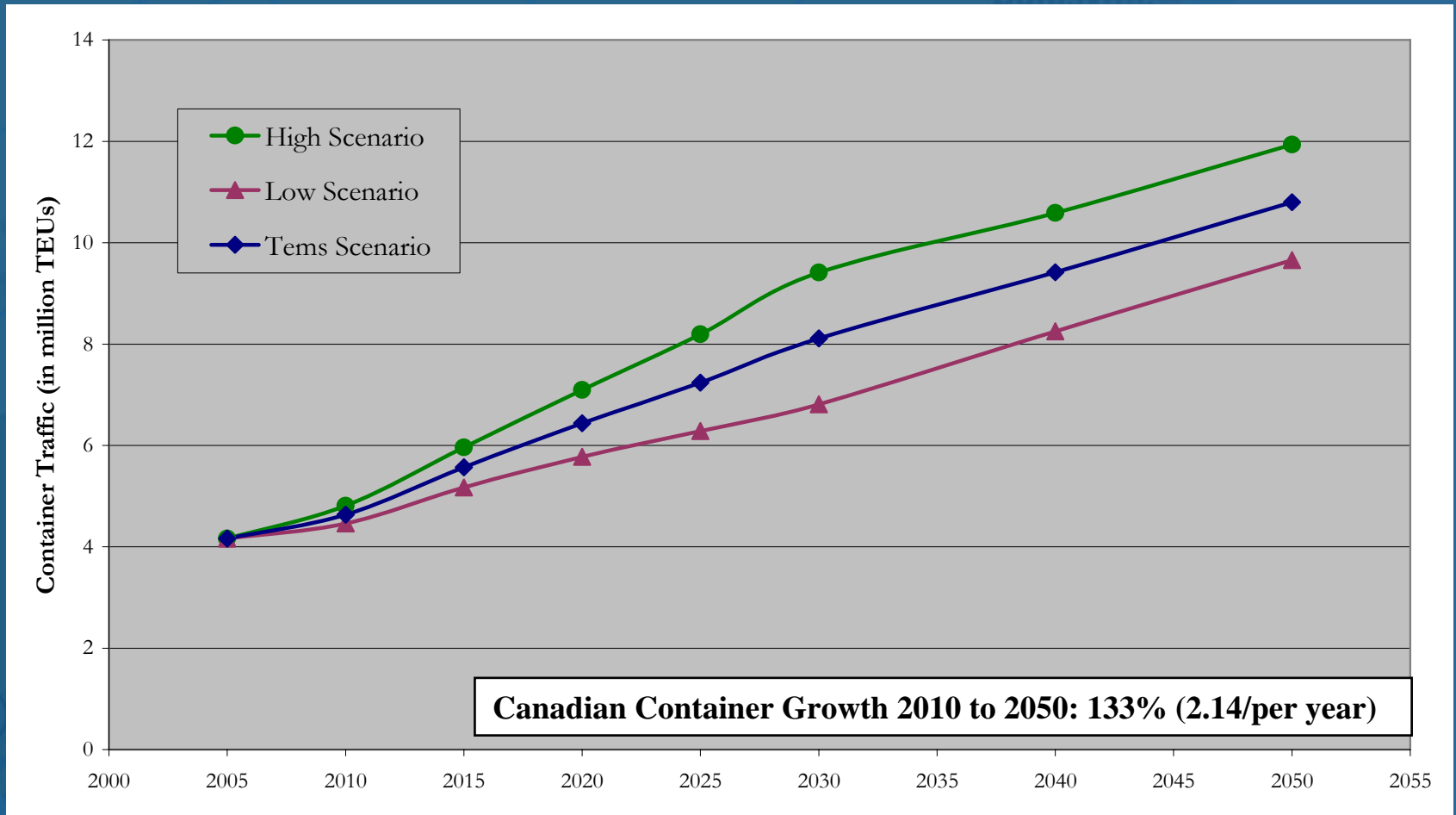


Canada (1980-2003)

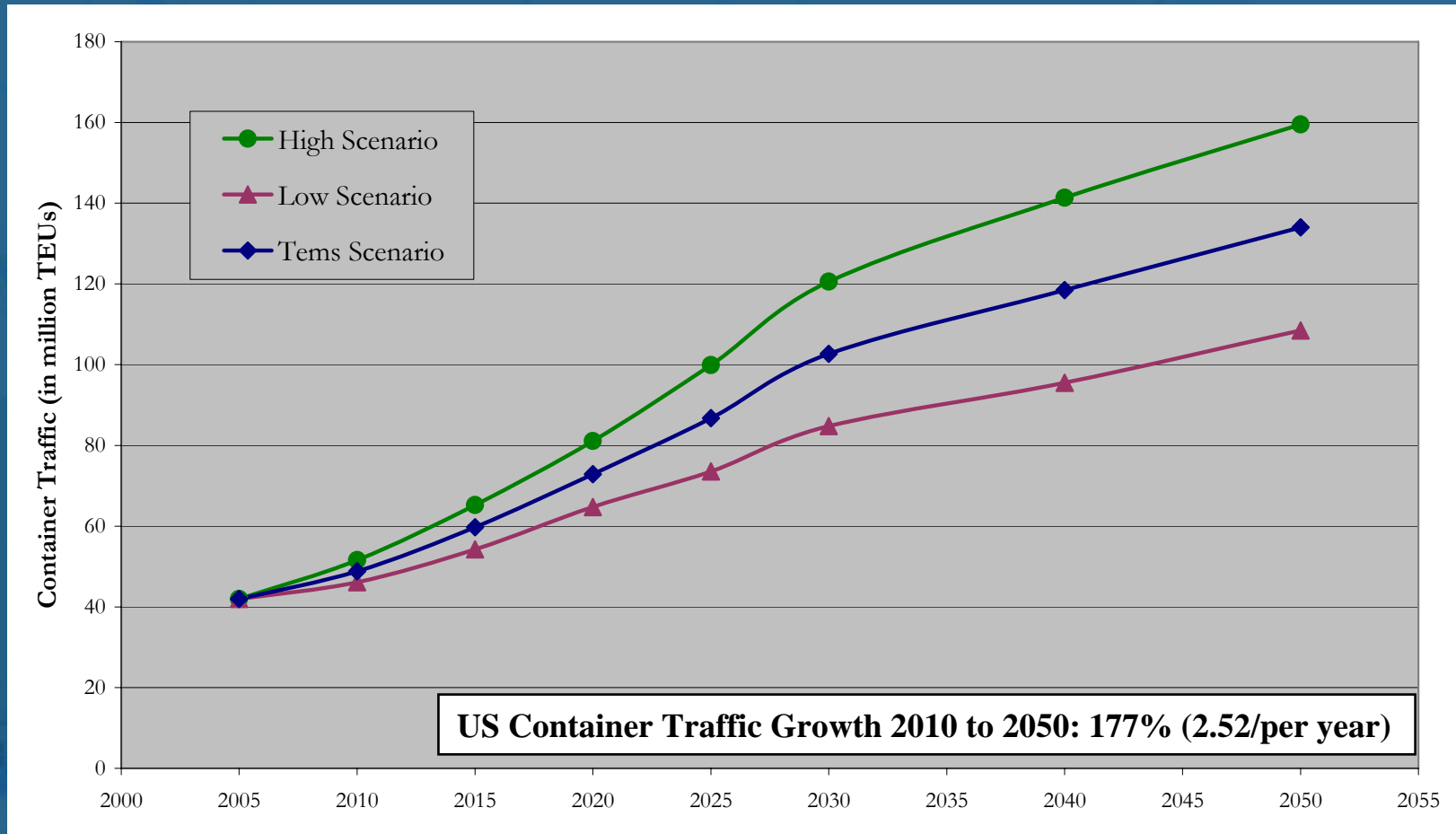


	B_0	B_1	T-value for β_1	T-value for β_0	R^2
United States	5.3316	-20.896	-18.7075	38.1121	0.9837
Canada	7.6642	-2.559	-18.2857	31.1220	0.9778

Canadian Container Traffic Forecast



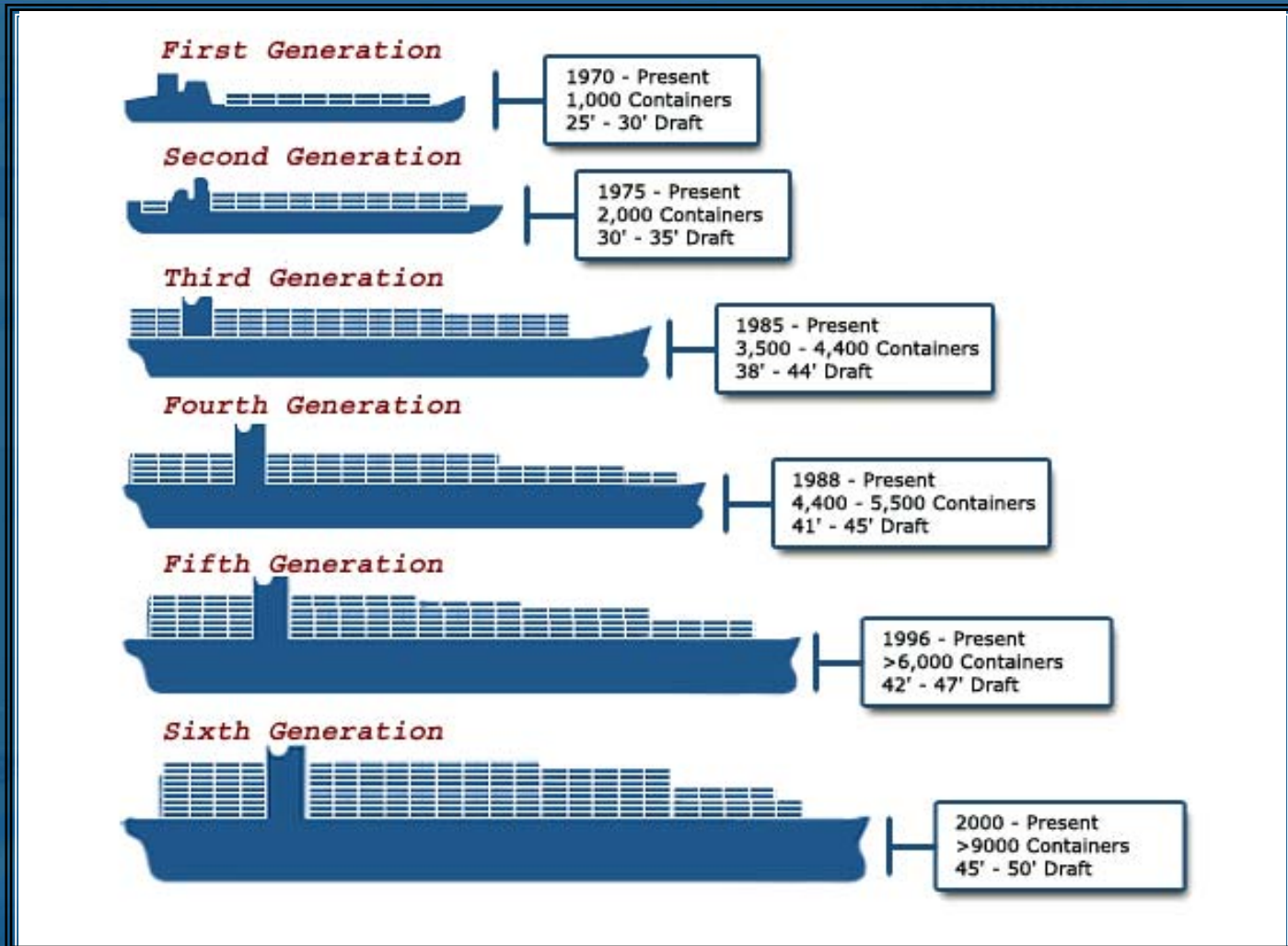
United States Container Traffic Forecast



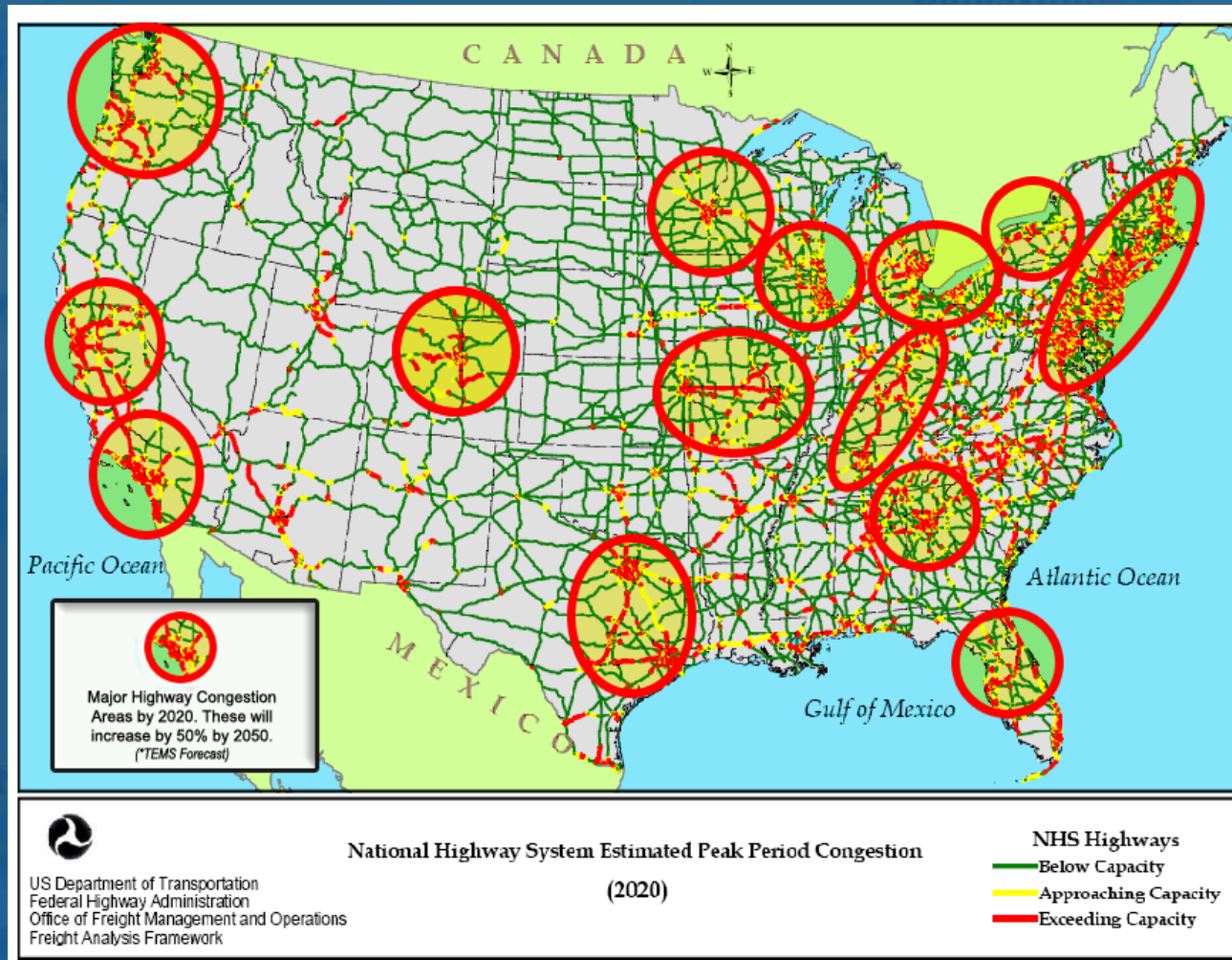
GLSLS Relationship to Rest of World



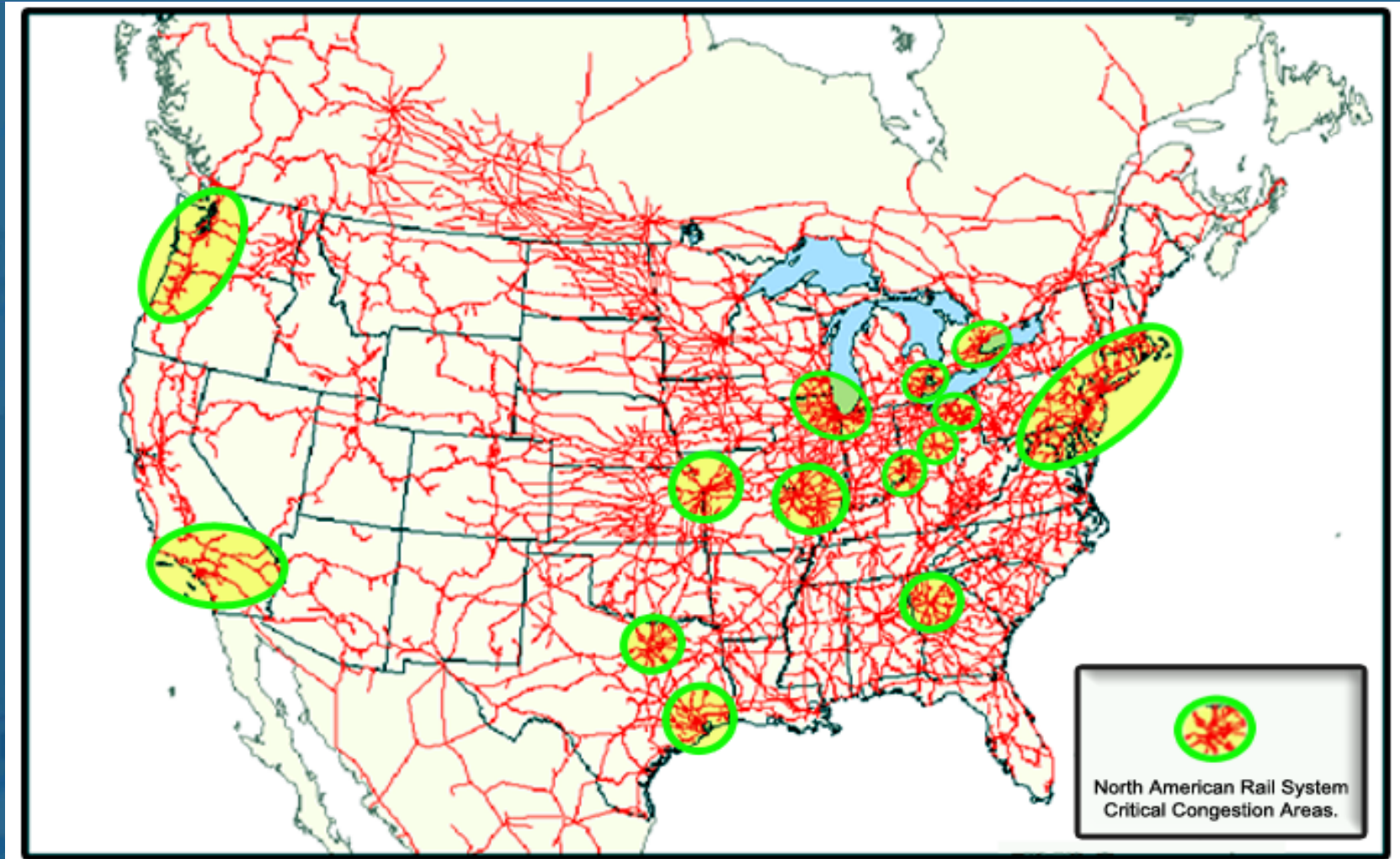
Infrastructure Constraints: The Evolution of the Container Ship



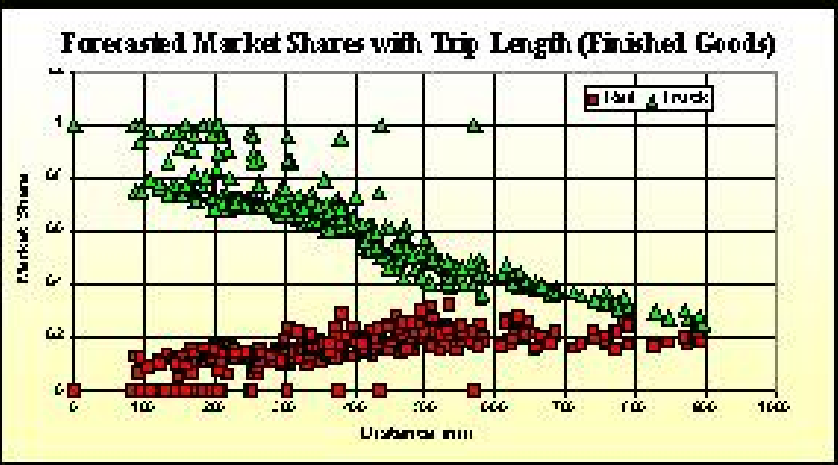
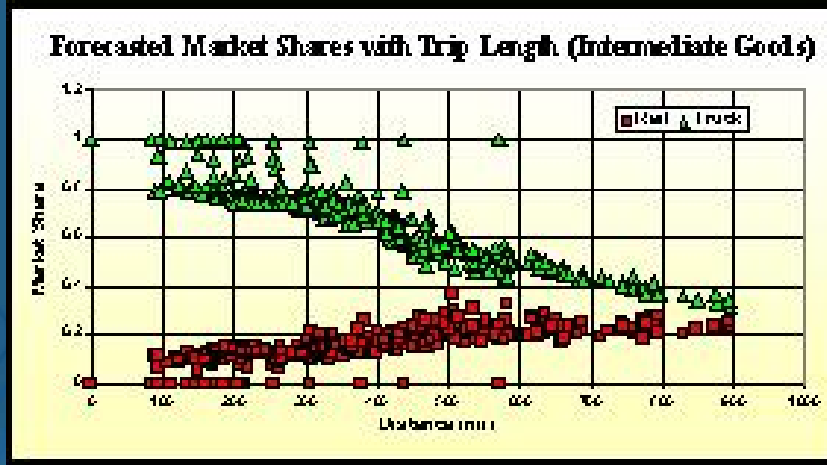
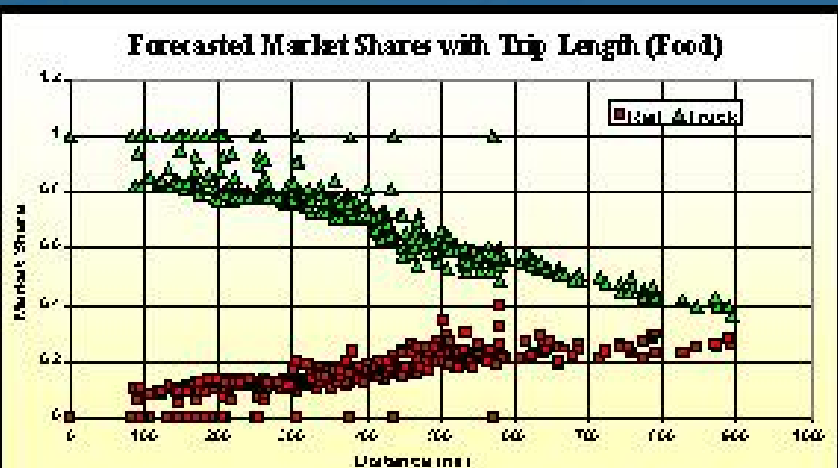
Infrastructure Capacity by 2020: Major Highway Congestion Areas



Infrastructure Capacity 2020: North American Rail Network Congestion



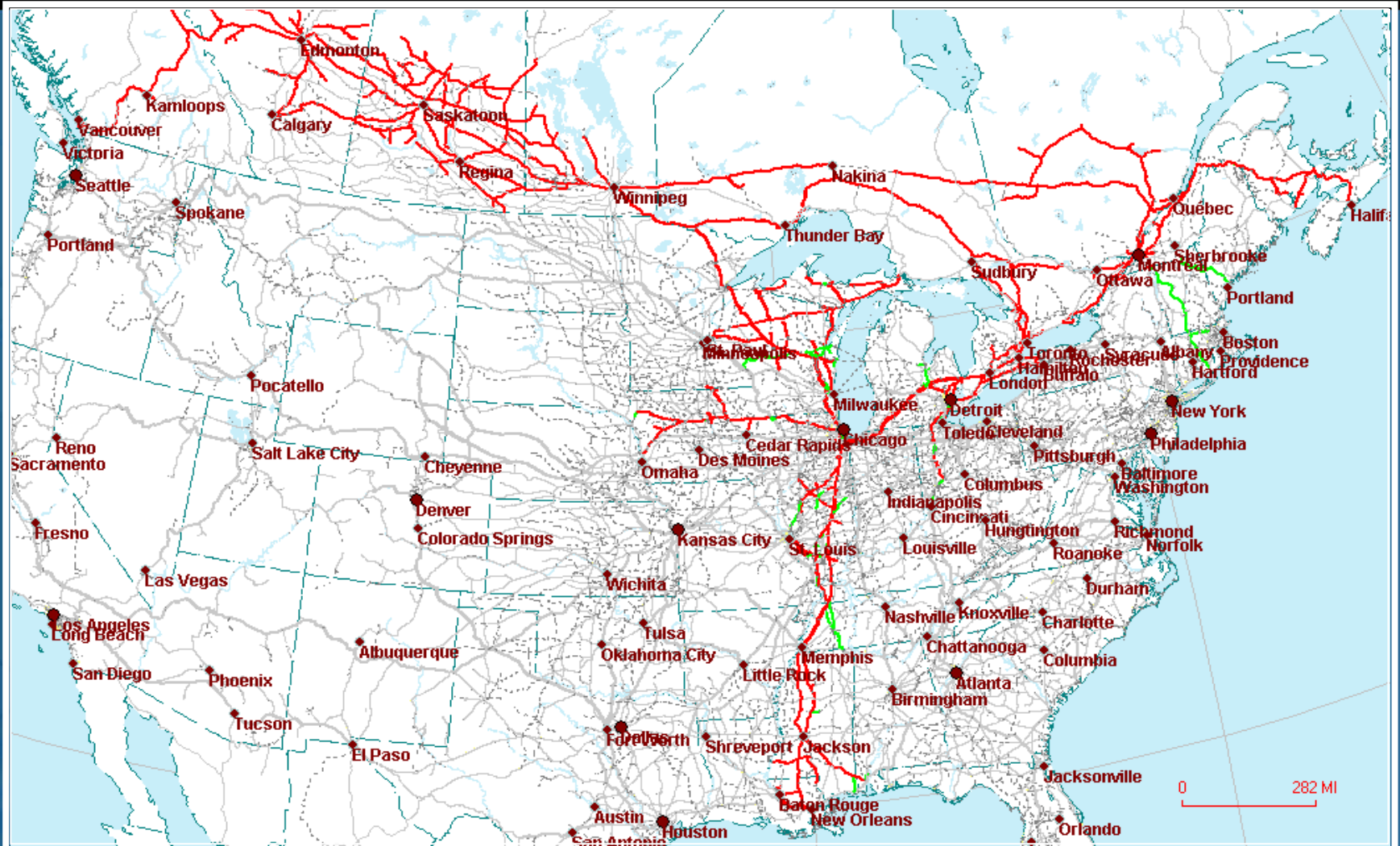
Modal Shares by Distance for Four Major Commodity Groups



Port to City Distance Matrix (US Ports)

		West Coast Ports			East Coast Ports			
		Seattle	Oakland	Los Angeles	New York	Baltimore	Miami	
Western Railroads find Mississippi Yards profitable	Salt Lake City	837	731	689	2173	2085	2549	Eastern Railroads need Western railroad connections for hauls to these cities
	Denver	1330	1265	1018	1780	1675	2076	
	Phoenix	1507	742	372	2458	2334	2401	
	Twin Cities	1666	2041	1930	1203	1115	1796	
	Kansas City	1868	1803	1621	1194	1071	1474	
	Dallas-Ft. Worth	2194	1803	1434	1580	1390	1415	Eastern Railroads maximum rail hauls are only just competitive
	Chicago	2066	2130	2019	793	704	1392	
	St. Louis	2117	2053	1828	955	832	1226	
	Memphis	2390	2087	1795	1106	917	1053	
	New Orleans	2721	2272	1903	1314	1124	894	
Western Railroads would find Eastern markets very profitable	Detroit	2359	2396	2285	613	525	1370	Intermediate markets are too short to be competitive for Eastern Railroads
	Cleveland	2420	2458	2347	462	382	1246	
	Columbus	2428	2453	2252	535	411	1160	
	Atlanta	2668	2474	2225	871	682	667	
	Buffalo	2616	2653	2542	398	405	1392	
	Pittsburgh	2544	2582	2443	370	247	1182	

CN Rail Operations



Port to City Distance Matrix (Canadian Ports)

	West Coast Ports		East Coast Ports	
	Vancouver	Prince Rupert	Halifax	Montreal
Twin Cities	1809	2192	1865	1255
Chicago	2209	2592	1455	846
St. Louis	2260	2797	1648	1135
Memphis	2532	3070	1786	1310
New Orleans	2863	3428	1994	1631
Toronto	2738	3121	861	338
Detroit	2501	2884	1084	561
Toledo	2463	2846	1222	617
Buffalo	2758	3141	923	397

Future Infrastructure Needs

- **AIR:** The Midwest and Northeast U.S. needs to develop and maintain extensive express air services.
- **TRUCK:** With respect to the trucking industry, road improvements are needed to improve truckload movement times due to the rapid growth of auto traffic and highway congestion.
- **RAIL:** For rail, significant investments to improve infrastructure for intermodal growth has been critical to improve the flow of traffic in the Midwest.
- **WATER:** This is one of the few transport modes in the Midwest that currently has capacity to spare; both the Mississippi/Ohio River and the Great Lakes and St. Lawrence Seaway systems. Infrastructure is needed for this mode to develop an intermodal capability.

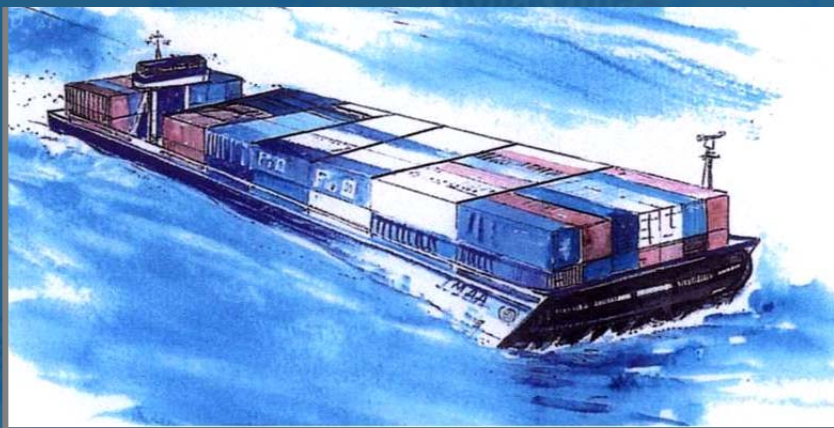
Water Technology



Containers on Barge



GLSLS Container Ship



PACSCAT



Fast Freighter

Technology Performance Summary

Vessel Type	Vessel Configuration	Cost per FEU-Mile	Transit Days, Halifax to Chicago
COB	159-FEU Ro/Ro 310-FEU Lo/Lo	\$0.21 \$0.11	8 1/2 days streamlined, or 11 days standard
SMALL SHIP	90-FEU Ro/Ro 20-kts 175-FEU Lo/Lo 20-kts	\$0.45 \$0.23	5 1/2 days
LARGE SHIP	342-FEU Ro/Ro 20-kts 665-FEU Lo/Lo 20-kts	\$0.23 \$0.12	5 1/2 days
PACSCAT	105-FEU Ro/Ro 20-kts 105-FEU Ro/Ro 40-kts	\$0.71 \$1.26	5 1/2 days 3 1/2 days
FAST FERRY	47-FEU Ro/Ro 20-kts 47-FEU Ro/Ro 40-kts	\$1.17 \$2.03	5 1/2 days 3 1/2 days
RAIL	100-FEU Conv Train	\$0.36	3 days
TRUCK	1 FEU Single Driver	\$1.75	2 3/4 days

“Agile” Ports Concept

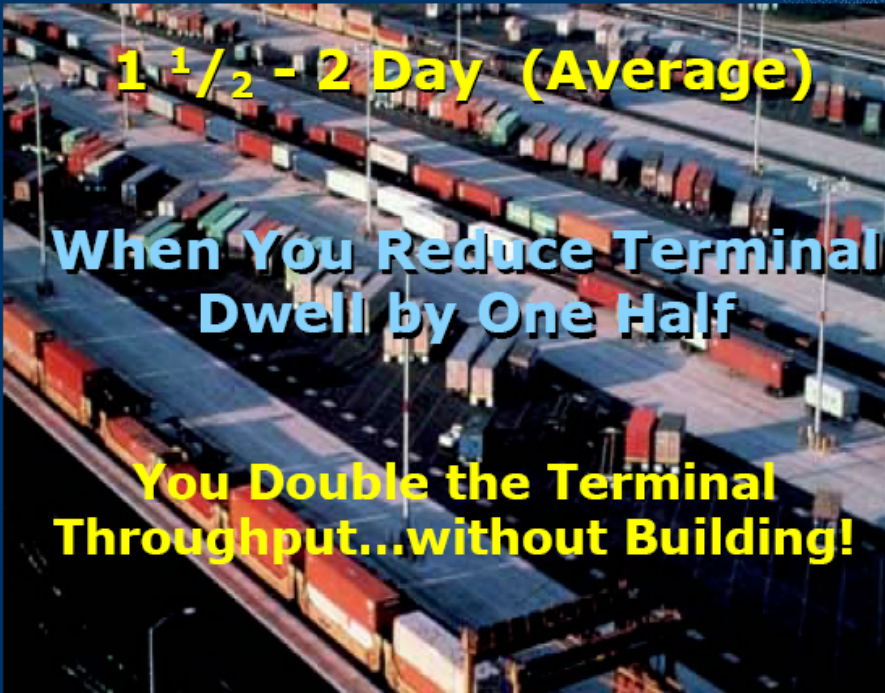
Definition

U.S. Intermodal Rail Terminal Dwell

1 1/2 - 2 Day (Average)

**When You Reduce Terminal
Dwell by One Half**

**You Double the Terminal
Throughput...without Building!**



The “Agile” port concept couples information systems to innovative terminal designs, producing a “Just in Time” approach to port operations

See :

http://www.transystems.com/presentations%5C2004/Pres_01_14_04/Pres_01-14-04.pdf

“Agile” Ports Concept

Can Improve Intermodal Economics

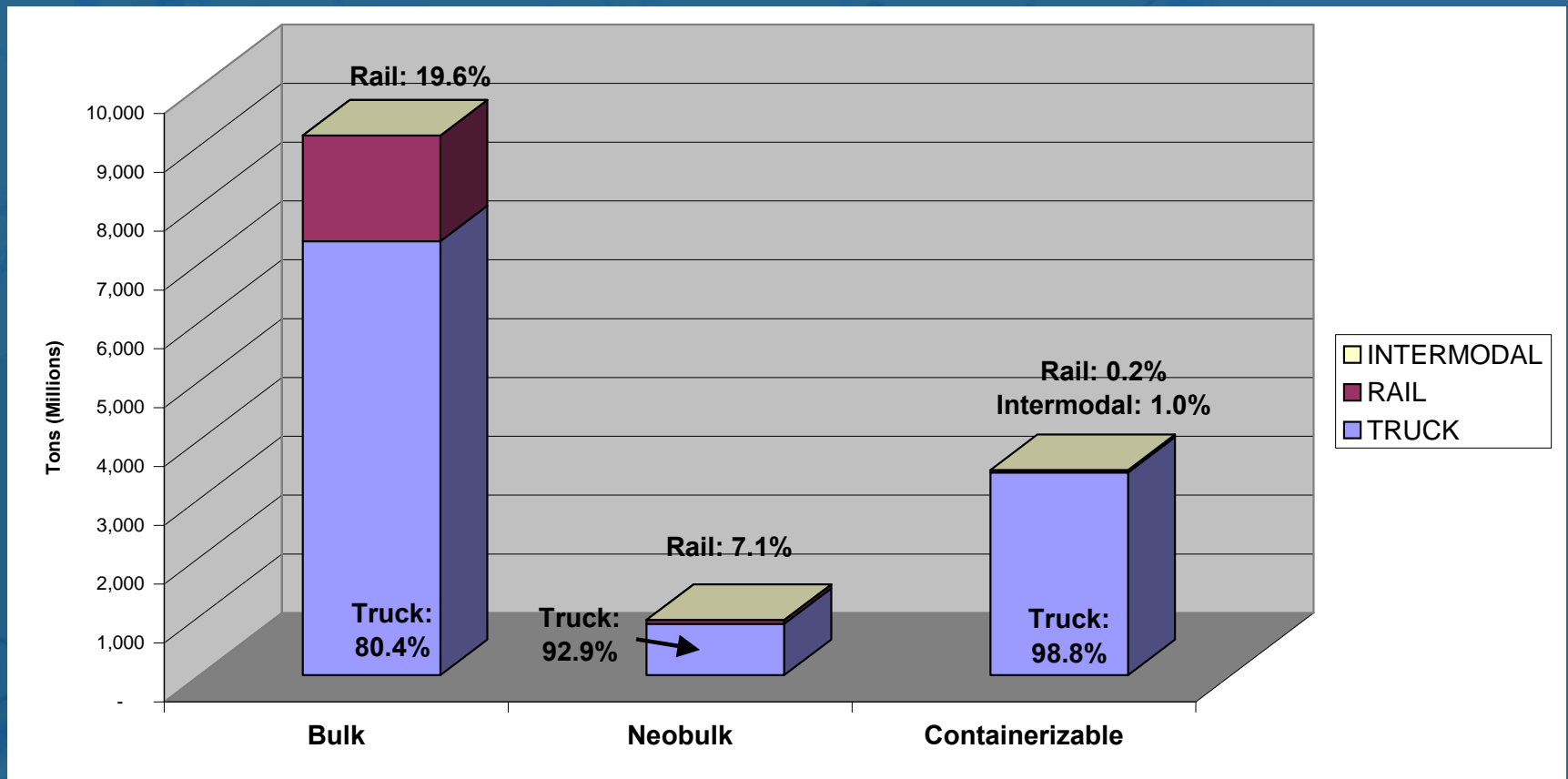
Inland Port Concept & Primary Purpose



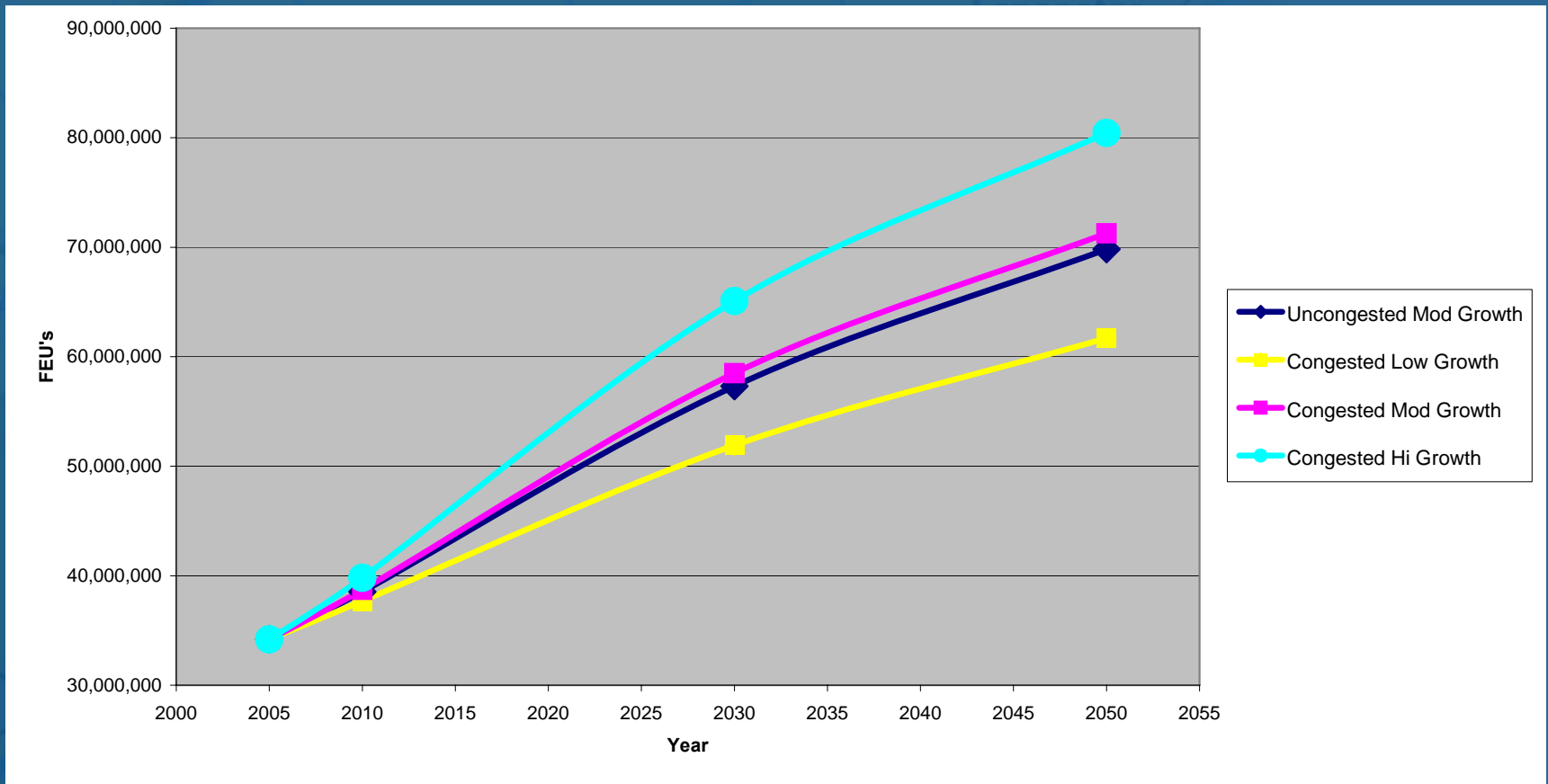
The key is to *shift* part of the seaport's workload to a remote site *while avoiding duplication of terminal costs*. The inland location functions as an extension of the seaport that forwards containers on a just-in-time basis. This reduces the incremental terminal costs associated with utilizing the rail or water-based intermodal shipping option.

See :http://www.scag.ca.gov/goodsmove/pdf/InlandPort_Smith0606.pdf

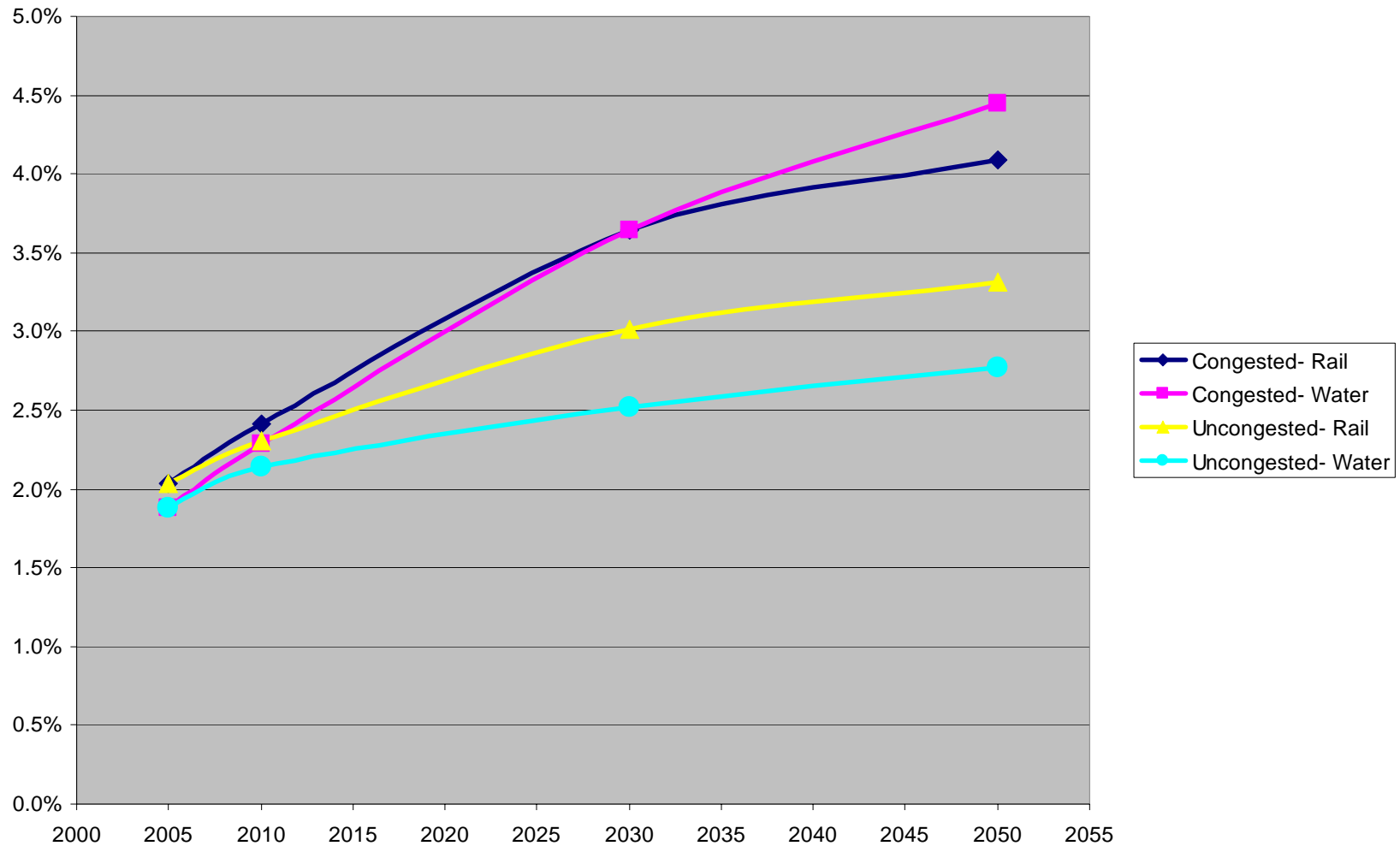
U.S. Originated Tonnage by Commodity Category For Surface Modes of Transportation



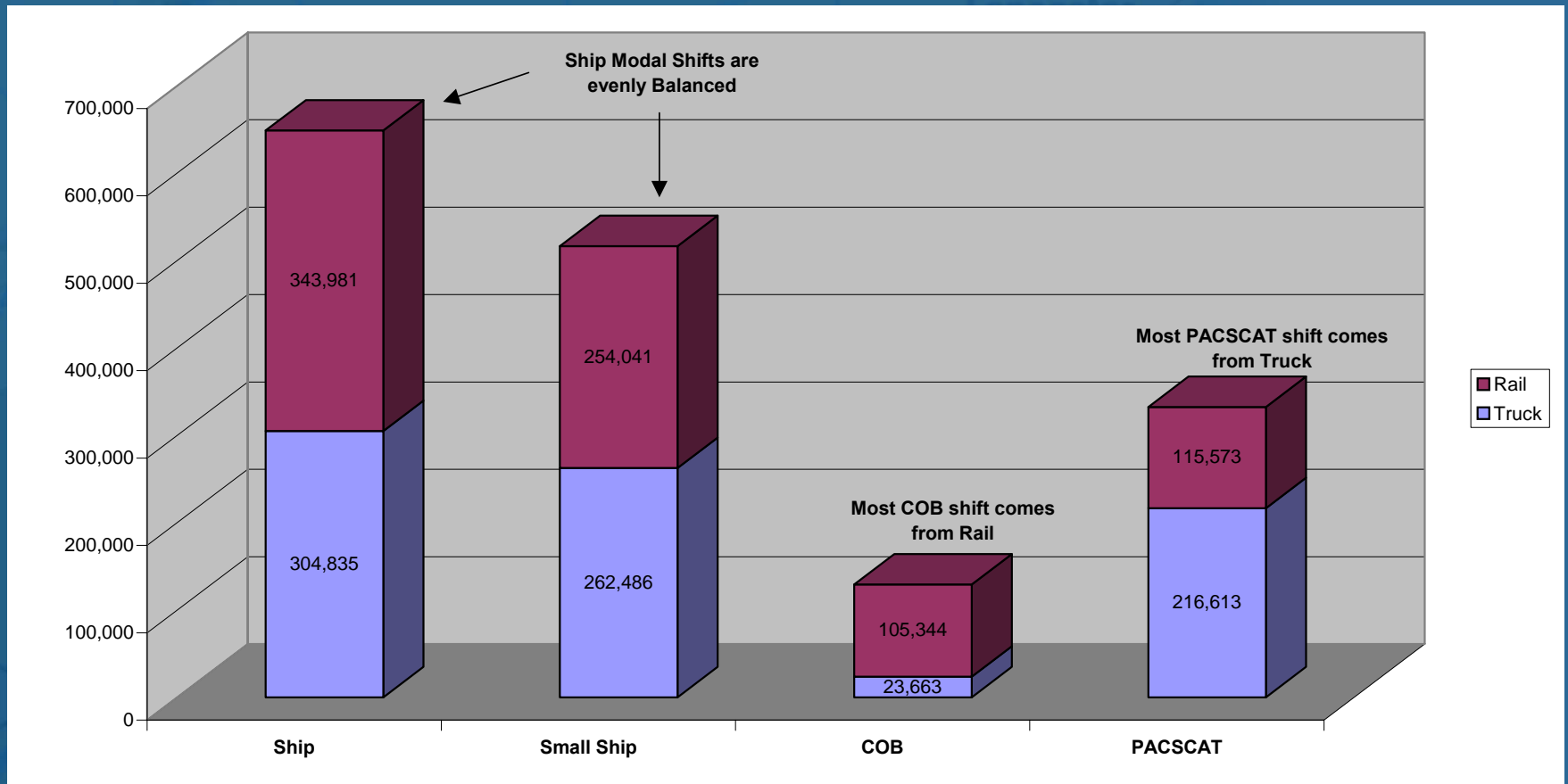
Total GLSLS Candidate Market



Forecast Market Shares by Mode



Forecast Source of Shifted FEUs



GLSLS Forecast Loaded FEU's— Summary

UNCONGESTED - MIDRANGE GROWTH

	2005	2010	2030	2050
SMALL SHIP	508,553	654,612	1,143,319	1,530,624
SHIP	644,170	823,554	1,441,748	1,934,960
PACSCAT	286,565	368,178	634,343	845,224
COB	127,231	159,302	286,634	388,477

CONGESTED - MIDRANGE GROWTH

	2005	2010	2030	2050
SMALL SHIP	508,553	685,830	1,567,842	2,360,963
SHIP	644,170	882,643	2,134,607	3,183,636
PACSCAT	286,565	373,180	762,729	1,174,656
COB	127,231	166,196	374,610	557,768

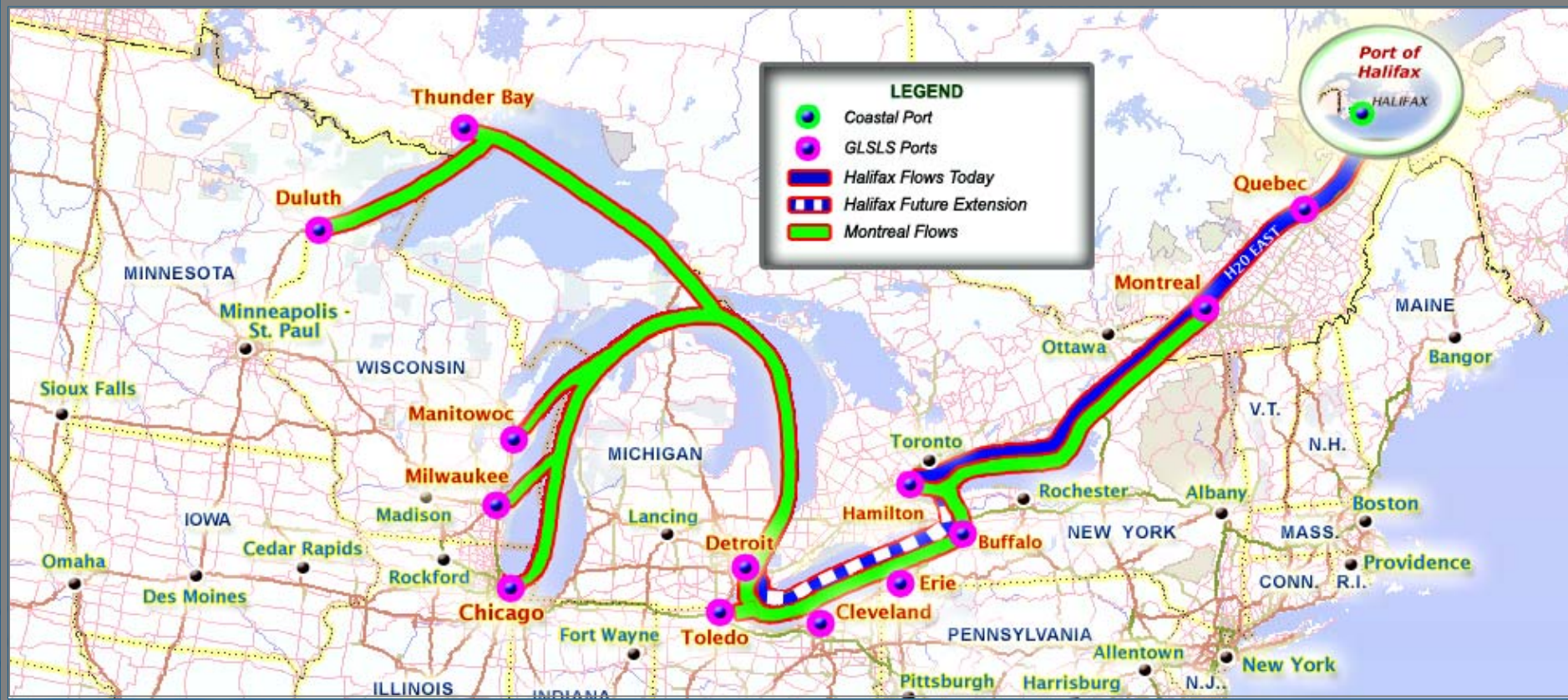
LOW AND HIGH GROWTH SENSITIVITIES for CONGESTED SHIP SCENARIO

	2005	2010	2030	2050
LOW GROWTH	644,170	858,200	1,835,896	2,700,821
HIGH GROWTH	644,170	918,421	2,431,252	3,626,578

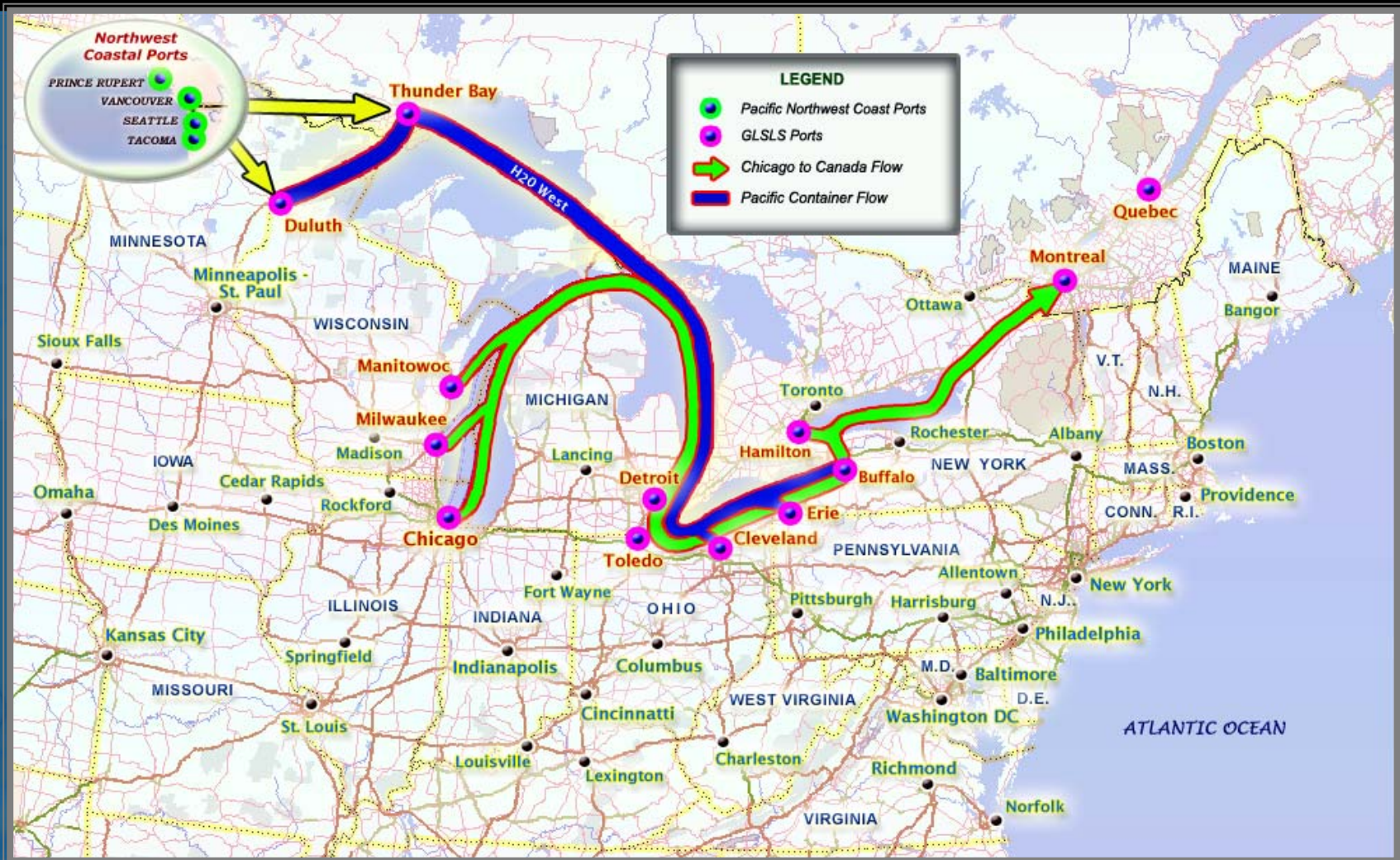
“Four Corners” Strategy for U.S. Midwestern Freight Market



H₂O East: Main Eastern GLSLS Flows



H₂O West: Main Western GLSLS Flows



Proposed Lake Erie and Lake Ontario Ferries



Base and future year demand for Freight Ferry and PACSCAT

Year	Freight Ferry		PACSCAT	
	Traffic	Market Share	Traffic	Market Share
2005	94,607	4.70%	165,443	7.66%
2010	114,501	4.70%	200,221	7.66%
2015	138,584	4.70%	242,315	7.66%
2020	167,738	4.70%	293,269	7.67%
2025	203,036	4.70%	354,952	7.67%
2030	245,775	4.71%	429,627	7.67%

Conclusion

- Analysis of future market conditions suggests that the water mode will play a major role in moving not just **bulk**, but **neobulk and container traffic**.
- It is **capacity limitations**, and rising **supply costs** that make water mode more attractive, but by using new technology water can become more attractive
- If investment **fails** to occur, in particular the **highway network**, increasing diversion to rail and water is inevitable.
- Given the **private ownership** of rail, and the **public ownership** of water, considerable leadership in intermodal coordination and collaboration will be needed to **maximize** the throughput of the US transportation system.



Thank you